

Arctic PBL cloud height and motion retrievals from MISR and MINX

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How Arctic clouds respond and feedback to sea ice loss is key to understanding of the rapid climate change seen in the polar region. As more open water becomes available in the Arctic Ocean, cold air outbreaks (aka. off-ice flow from polar lows) produce a vast sheet of roll clouds in the planetary boundary layer (PBL). The cold air temperature and wind velocity are the critical parameters to determine and understand the PBL structure formed under these roll clouds. It has been challenging for nadir visible/IR sensors to detect Arctic clouds due to lack of contrast between clouds and snowy/icy surfaces. In addition, PBL temperature inversion creates a further problem for IR sensors to relate cloud top temperature to cloud top height. Here we explore a new method with the Multiangle Imaging Spectro-Radiometer (MISR) instrument to measure cloud height and motion over the Arctic Ocean. Employing a stereoscopic technique, MISR is able to measure cloud top height accurately and distinguish between clouds and snowy/icy surfaces with the measured height. We will use the MISR Interactive eXplorer (MINX) to quantify roll cloud dynamics during cold-air outbreak events and characterize PBL structures over water and over sea ice.